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EXAMINER	
LEUNG, JENNIFER A	
ART UNIT	**PAPER NUMBER**
1764	

DATE MAILED: 05/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/807,851	JIANG ET AL.	
	Examiner	Art Unit	
	Jennifer A. Leung	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *19-33,36-46,48,52-58 and 60-69* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *19-33,36-46,48,52-58 and 60-69* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment submitted on February 23, 2006 has been received and carefully considered. The changes made to the specification and drawings are acceptable. Claims 1-18, 34, 35, 47, 49-51 and 59 are cancelled. Claims 19-33, 36-46, 48, 52-58 and 60-69 are under consideration.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 19-25, 29-31 and 37-46 are rejected under 35 U.S.C. 102(b) as being anticipated by Kolbel et al. (US 2,853,369).

Regarding claims 19 and 23-25, Kolbel et al. (FIG. 7a, 7b; column 4, line 67 to column 5, line 16) discloses an apparatus comprising:

a reaction vessel (i.e., reactor **1**; FIG. 7a) with an internal diameter Dr greater than or equal to 0.6 meter (i.e., the reactor comprises "a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more," column 3, lines 43-52);

a plurality of internal structures (i.e., shafts **4** and a heat exchanger pipe system **7**) disposed within the reaction vessel **1**, wherein the structures **4,7** are arranged so as to create a plurality of reaction zones in the reaction vessel **1** (i.e., in the spaces between elements **4** and **7**);

the internal structures having a characteristic size d, wherein d is from 2.5 cm to about 13

cm (e.g., vertical shafts with a diameter of at least 5 cm; see column 3, lines 53-56; column 4, lines 31-34);

wherein each reaction zone is in fluid communication with at least one adjacent reaction zone, and the plurality of internal structures **4,7** is configured such that each of the reaction zones has a characteristic size Ds that is less than the reaction vessel internal diameter Dr (see FIG. 7b; also see FIG. 8, 9 and 4-6); and

a gas distributor (i.e., a central gas inlet **2**, FIG. 7a; see also FIG. 10a, 10b, 10c, 11) disposed near the bottom of the reaction vessel **1**, suitable for passing a gas phase through the liquid into the plurality of reaction zones, and creating a gas flow and a liquid flow in each of the zones (see column 3, line 59 to column 4, line 28).

Regarding claim 20, the plurality of reaction zones is created by a patterned arrangement of internal structures **4**, **7** (see FIG. 7a, 7b; also see FIG. 8, 9 and 4-6, wherein structure **4** is represented by **a** and structure **7** is represented by **b**).

Regarding claim 21, the patterned arrangement of structures **4,7** may create a cross sectional shape of the reaction zones that is circular, rectangular, concentric circular, and combinations thereof (see FIG. 7b, 8, 9; also see FIG. 4-6; the structure **4** is designated as reference character **a**, and the structure **7** is designated as reference character **b**).

Regarding claim 22, the structures **4** and **7** are arranged in various patterns to create repeating zones (see FIG. 7b, 8, 9; also see FIG. 4-6; the structure **4** is designated as reference character **a**, and the structure **7** is designated as reference character **b**).

Regarding claim 29, Kolbel discloses that the reaction vessel comprises, "... a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more, and more than

1.5 m. in height, which height above the gas inlet is at least as great as the diameter of the oven." (column 3, lines 43-58). Taking a horizontal diameter of 31 cm. and a height of 1.6 m. as a sample calculation, the height to diameter ratio of the reaction vessel is about 5.

Regarding claim 30, the reaction zones may have a height to diameter ratio between about 7 and about 180 (i.e., "[t]he ratio of the height to the diameter of the shafts [**4**] can be between 10 and 200, preferably between 20 and 100," column 4, lines 38-40).

Regarding claim 31, internal structures **4** and **7** have a characteristic size *d* (i.e., representing the thickness of an internal structure **4** or a diameter of internal structure **7**) that is smaller than *Ds* (i.e., representing each zone between structures **4** and 7). (see FIG. 7b, 8, 9, 4-6).

Regarding claims 37-39 and 44, the structures are permeable to gas and liquid (i.e., gas and liquid may pass through the structure **4**, from the bottom opening in the sump to the upper opening in the vapor space.

Regarding claim 40, the internal structures **4** and **7** are parallel so as to create repeating parallel reaction zones (see FIG. 7a, 7b; also see FIG. 8, 9 and 4-6).

Regarding claims 41 and 42, structures **4** and **7** include tubes or rods having a circular cross-sectional shape (see FIG. 7a, 7b, 8, 9, 4-6).

Regarding claim 43, the internal structures **4** and **7** include heating or cooling tubes (i.e., structures 7 are heat exchange tubes).

Regarding claims 45 and 46, the apparatus of Kolbel et al. structurally meets the claims because the use of the apparatus as a "hydrocarbon synthesis reactor" or a "slurry bubble column" is considered an intended use that provides no further patentable weight to the claims.

Instant claims 19-25, 29-31 and 37-46 structurally read on the apparatus of Kolbel et al.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 26-28, 32, 33, 36, 48, 52-58 and 60-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kolbel et al. (US 2,853,369).

Regarding claim 26, Kolbel et al. discloses that the reaction vessel comprises, "a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more," (column 3, lines 43-58). Kolbel, however, is silent as to the horizontal diameter *Dr* being, specifically, greater than or equal to 10 m. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a horizontal diameter *Dr* that was greater than or equal to 10 m. in the apparatus of Kolbel et al., on the basis of suitability for the intended use thereof, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 27 and 28, Kolbel discloses that, "[w]hen the pipes [7] are conducted through the inside of the shafts [4], the distance between each pipe and between the pipe and the inside wall of the shaft should not be less than 3 cm." (column 5, lines 28-31). In addition, Kolbel discloses that, "[t]he diameter of the shafts [4] should be at least 5 cm. and can amount to 30 cm. or more. It conforms to the height and to the cross section of the pipes [7] installed in the shafts [4] for heat exchange." (column 4, lines 31-34). Although Kolbel is silent as to the characteristic size *Ds* being between about 0.15 meter and about 0.5 meter, or between about 0.15 meter and about 0.5 meter, it would have been obvious for one of ordinary skill in the art at

the time the invention was made to select a suitable *Ds*, such as one of the instantly claimed ranges of *Ds*, in the apparatus of Kolbel et al., on the basis of suitability for the intended use, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 32 and 33, Kolbel discloses that, "[w]hen the pipes [7] are conducted through the inside of the shafts [4], the distance between each pipe and between the pipe and the inside wall of the shaft should not be less than 3 cm." (column 5, lines 28-31). Although Kolbel is silent as to the spacing *Di* between centers of adjacent internal structures **4** and **7** being between about 1.1*d* and about 4*d*, or between about 1.2*d* and about 3*d*, where d is a characteristic size of each of the plurality of internal structures **4** and **7**, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable *Di*, such as one of the instantly claimed ranged of *Di*, in the apparatus of Kolbel et al., on the basis of suitability for the intended use, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claim 36, Kolbel discloses that, "[w]hen the pipes [7] are conducted through the inside of the shafts [4], the distance between each pipe and between the pipe and the inside wall of the shaft should not be less than 3 cm." (column 5, lines 28-31). In addition, Kolbel discloses that, "[t]he diameter of the shafts [4] should be at least 5 cm. and can amount to 30 cm. or more. It conforms to the height and to the cross section of the pipes [7] installed in the shafts for heat exchange." (column 4, lines 31-34). Although Kolbel is silent as to the specific

characteristic size *d* for each of the plurality of internal structures **4** and **7**, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable characteristic size *d*, such as a characteristic size *d* within one of the instantly claimed ranges, in the apparatus of Kolbel et al., on the basis of suitability for the intended use thereof, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 48, 52, 60, 61 and 64, Kolbel et al. (FIG. 7a, 7b; column 4, line 67 to column 5, line 16) discloses an apparatus comprising:

a large diameter reaction vessel **1** capable of having a liquid contained therein, with an internal diameter Dr greater than or equal to 0.6 meter (i.e., the reactor comprises "a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more," column 3, lines 43-52);

a means for reducing the liquid axial dispersion coefficient and backmixing within the reaction vessel (i.e., a plurality of shafts **4**; a plurality of heat exchange pipes **7**), wherein said means comprises a non-uniform distribution of internal structures arranged in a manner to create a plurality of discrete zones (i.e., in the spaces between elements **4** and **7**); and

a means **2** for introducing gas into the plurality of discrete zones within reaction vessel **1**.

Kolbel is silent as to structures **4,7** specifically comprising an area of about 10% to about 25%, or about 15% to about 25%, or about 15% to about 20%, or about 5% to about 20%, of the cross-sectional area of the reaction vessel **1**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate area for the

internal structures **4** and **7** relative to the cross sectional area of the reaction vessel **1** in the apparatus of Kolbel et al., on the basis of suitability for the intended use thereof, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claim 53, the internal structures **4** and **7** are arranged in various patterns to create reaction zones within the reaction vessel **1** (see FIG. 7b, 8, 9, 4-6), wherein each reaction zone is in fluid communication with at least one adjacent reaction zone (e.g., via the spaces between each of the structures **4** and **7**).

Regarding claim 54, the reaction vessel **1** has an internal diameter *Dr*, and each of the reaction zones (i.e., as defined by the spaces between structures **4** and **7**) has a characteristic size Ds, wherein Ds is less than Dr (see FIG. 7b; also see FIG. 8, 9 and 4-6).

Regarding claim 55, the internal structures **4** and **7** are parallel so as to create parallel reaction zones within the reaction vessel (see FIG. 7a, 7b, 8, 9, 4-6).

Regarding claim 56, the internal structures **4** and **7** are arranged in various patterns to create repeating reaction zones within the reaction vessel (see FIG. 7a, 7b, 8, 9, 4-6).

Regarding claim 57, the internal structures **4** and 7 are part of a cooling coil (i.e., structure **7** is part of a heat exchange pipe system) comprising a continuous set of vertical tubes connected by a connection means (see FIG. 7a).

Regarding claim 58, structures **4** and **7** are part of one or more coils comprising a continuous set of vertical components connected by a connection means (i.e., structure **7** is a heat exchange pipe system; see FIG. 7a).

Regarding claims 62 and 63, means **4** and **7** comprise a non-uniform distribution of internal structures (i.e., as defined by Applicants in section [0025], a distribution is non-uniform if, when dividing the reaction vessel into zones of 5% to 20% of the total area, the formed zones do not comprise identical configurations and/or area of internal structures. See FIG. 7b, 8, 9 and 4-6, wherein arbitrarily drawn zones of 5% to 20% of the total area meet this definition).

Regarding claims 65 and 66, the reaction vessel **1** may comprise at least 2, and furthermore, at least 4, distinct circular reaction zones (i.e., see FIG. 4, 5 and 6, wherein each reaction zone defined by a respective shaft **4** is designated by reference character **a**).

Regarding claim 67, the plurality of internal structures **4** and **7** comprises active structures (i.e., a catalyst suspension).

Regarding claim 68, the various gas distributors **2** (see FIG. 10a-c; 11) are known to be structurally and inherently suitable for passing a gas flow of the recited velocities.

Regarding claim 69, the plurality of internal structures are capable of minimizing liquid axial dispersion to achieve a productivity similar to that obtained from a multitude of reactors with diameter of characteristic size Ds (see column 3, line 74 to column 4, line 28).

Response to Arguments

4. Applicant's arguments with respect to the rejection of claims 19-33, 36, 40-43, 45, 46, 48, 52-54 and 57-69 under 35 U.S.C. 102(b) or 103(a) over Kolbel et al. have been fully considered but they are not persuasive. Applicants (beginning on page 18, third paragraph) argue,

> "Kolbel does not disclose <u>wherein each reaction zone is in fluid communication with at least one adjacent reaction zone</u>. On the contrary, Kolbel discloses a column apparatus which is subdivided into similar vertical shafts which have ***liquid-tight*** casing surfaces."

The Examiner respectfully disagrees. As disclosed by Kolbel (column 3, lines 53-55), the vertical shafts are open at the top and bottom, such that the open top is in fluid communication with at least one adjacent reaction zone via the free gas space above the liquid level, and the open bottom is in fluid communication with at least one adjacent reaction zone via the liquid containing sump of the reactor.

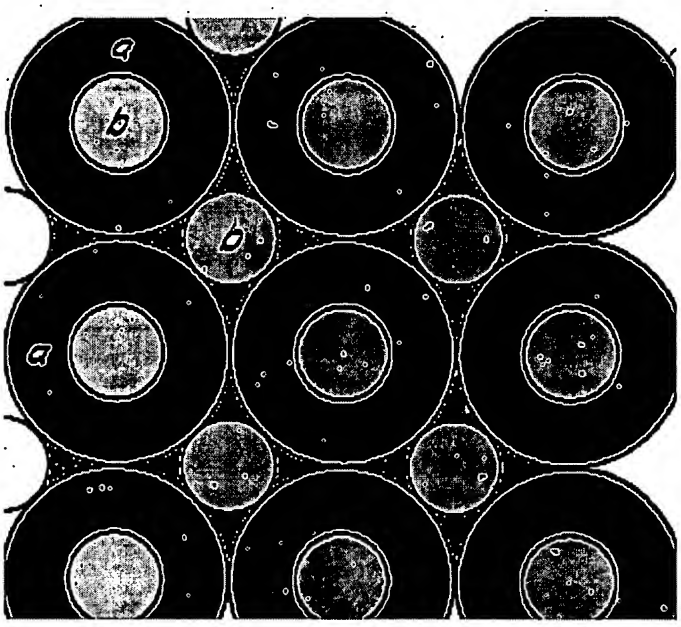
Applicants (beginning on page 18, fourth paragraph) argue,

> "Furthermore, Kolbel does not disclose said means for reducing comprising a non-uniform distribution of internal structures. Instead, Kolbel unequivocally discloses an even and uniform distribution of shafts along a cross-section of the column as illustrated in Figures 3, 4, 5, 6, 7b, 8, and 9. Thus, Kolbel does not disclose all the elements of Claim 48."

The Examiner respectfully disagrees. Applicants have defined a "non-uniform distribution" as follows (taken from section [0025] of the specification):

> The configurations are sometimes referred to as reaction zones created through non-uniform distribution of internal structures within a reaction vessel. This reference is intended to distinguish the general embodiments of the present invention over configurations of fully uniform-equally spaced internal structures. The embodiments described herein are intend to have varying degrees of non-uniformity ranging from, but not including, fully uniform-equally spaced configures to completely random configurations. It is contemplated that one embodiment may comprise non-uniformity as a function of the cross-sectional area of the reaction vessel. Specifically, a preferred embodiment may comprise a completely non-uniform configuration at 5% to 20% of the total cross-sectional area. Stated differently, dividing the cross-sectional area of a reaction vessel into zones of 5% to 20% of the total area, the formed zones should not comprise identical configurations and/or area of internal structures.

It appears that Applicants have defined non-uniformity as the creation of reaction zones having differing cross-sectional areas, as contained within a selected region of the reactor having an area of approximately 5% to 20% of the total cross-sectional area of the reactor. Looking now to Figure 6 of Kolbel, for example, we see that the different reaction zones, as defined by the spaces between structures **a** and **b**, have different cross-sectional areas (shaded below):



Each of the dark, medium, and lightly shaded reaction zones each comprise cross-sectional areas that are different from one other.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
April 28, 2006

ALEXA DOROSHENK NECKEL
PRIMARY EXAMINER